DESCRIPTION

IMAGE SUPPLY DEVICE, RECORDING SYSTEM, AND RECORDING
CONTROL METHOD

5   TECHNICAL FIELD

The present invention relates to a technique for
recording an image in accordance with a recording
instruction from an image supply device such as a
digital camera or the like.

10

BACKGROUND ART

In recent years, digital cameras (image sensing
devices) which can sense images and convert them into
digital image data by simple operations have been
15   prevalent. When an image sensed by such camera is
printed and is used as a photo, it is a common practice
to temporarily download the sensed digital image data
from a digital camera to a PC (computer), to execute an
image process by that PC, and to output the processed
20   image data from the PC to a color printer, thus
printing an image.

By contrast, a color print system which allows a
digital camera to directly transfer digital image data
to a color printer without the intervention of any PC
25   and can print it out, a color printer, i.e., a
so-called photo-direct (PD) printer which can receive a
memory card, which is mounted on a digital camera and

stores sensed images, and can print sensed images stored in the memory card, and the like have recently been developed.

A print system that prints an image sensed by a
5 digital camera designates an image to be printed, the number of copies to be printed, and the like using DPOF. That is, the digital camera saves select information of an image (images) to be printed, its procedure, and the like on a storage medium such as a memory card or the
10 like that stores sensed image data, and the digital camera which mounts the storage medium is connected to a printer or the storage medium itself is mounted on the printer, thus allowing a print process under desired print conditions without the intervention of
15 any PC. The contents held on the storage medium include image information to be printed, print conditions such as the paper size, the number of copies, and the like, and so forth. However, since the digital camera normally generates a DPOF file in offline
20 (without being connected to the printer), there is no guarantee that a print process according to the print conditions set by that DPOF is realized by the connected printer. For this reason, the print process cannot often be made under the print conditions set by
25 the DPOF.

DISCLOSURE OF THE INVENTION

The present invention has been made in

consideration of the aforementioned prior arts, and has

features to execute a recording process using a

recording condition of image data stored in a storage

5   medium, and another recording condition that uses the

functions of a recording apparatus, which is connected

to an image supply device and is used in the recording

process.

Other features and advantages of the present

10   invention will be apparent from the following

descriptions taken in conjunction with the accompanying

drawings, in which like reference characters designate

the same or similar parts throughout the figures

thereof.

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BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated

in and constitute a part of the specification,

illustrate embodiments of the invention and, together

20   with the descriptions, serve to explain the principle

of the invention.

Fig. 1 depicts a schematic perspective view of a

PD printer according to an embodiment of the present

invention;

25   Fig. 2 depicts a schematic view of a control

panel of the PD printer according to the embodiment of

the present invention;

Fig. 3 is a block diagram showing the arrangement
of principal part associated with control of the PD
printer according to the embodiment of the present
invention;

5   Fig. 4 is a block diagram showing the arrangement
of an ASIC of the PD printer according to the
embodiment of the present invention;

Fig. 5 is a block diagram showing the arrangement
of a digital camera according to the embodiment of the

10   present invention;

Fig. 6 depicts a chart for explaining an outline
of a CDPS communication procedure according to the
embodiment of the present invention;

Fig. 7 depicts a schematic diagram for explaining

15   the interfaces and software configurations of the PD
printer and digital camera, which incorporate the CDPS
according to the embodiment of the present invention;

Fig. 8 depicts a schematic diagram of service
functions in the CDPS according to the embodiment of

20   the present invention;

Fig. 9 is a flow chart for explaining an outline
of the processes up to a print process in the CDPS
according to the embodiment of the present invention;

Fig. 10 depicts a schematic diagram of service

25   functions of the DSC and PD printer in the CDPS
according to the embodiment of the present invention;

Fig. 11 is a flow chart for explaining an outline
of the processes after the PD printer and DSC according
to the embodiment of the present invention have been
connected until the CDPS starts;

5   Fig. 12 depicts a diagram showing an example of
function assignment of the DSC and PD printer in the
CDPS according to the embodiment of the present
invention;

Fig. 13 depicts a diagram showing another example
10   of function assignment of the DSC and PD printer in the
CDPS according to the embodiment of the present
invention;

Fig. 14 depicts a diagram showing still another
example of function assignment of the DSC and PD
15   printer in the CDPS according to the embodiment of the
present invention, in which the DSC is handled as a
mass storage;

Figs. 15A and 15B depicts views for explaining
function commands in the CDPS according to the
20   embodiment of the present invention;

Fig. 16 is a flow chart for explaining service
functions and the flow of processes between the DSC and
PD printer in the CDPS according to the embodiment of
the present invention;

25   Fig. 17 is a flow chart for explaining an example
of assignment of service functions and the flow of

processes between the DSC and PD printer in the CDPS

according to the embodiment of the present invention;

Fig. 18 is a flow chart for explaining another

example of assignment of service functions and the flow

5   of processes between the DSC and PD printer in the CDPS

according to the embodiment of the present invention;

Fig. 19 is a chart for explaining an

implementation example of CDPS service discovery

(CDPS_ServiceDiscovery) using the PTP architecture;

10   Fig. 20 is a chart for explaining an

implementation example of a procedure that notifies

procedures used by the camera in the CDPS

(CDPS_ServiceDiscovery) using the PTP architecture;

Fig. 21 is a chart for explaining an

15   implementation example of notification (CDPS_Service)

of printer functions in the CDPS using the PTP

architecture;

Fig. 22 is a chart for explaining an

implementation example of a procedure of a function

20   (CDPS_JobData) that allows the PD printer to acquire an

image file in the CDPS using the PTP architecture;

Fig. 23 is a chart for explaining an

implementation example of a function (CDPS_PageStart)

that allows the PD printer to instruct the camera to

25   start a print process in the CDPS using the PTP

architecture;

Fig. 24 is a chart for explaining an
implementation example of a function (CDPS_PageEnd)
that allows the PD printer to send a print end command
for one page to the camera in the CDPS using the PTP
5   architecture;

Fig. 25 is a chart for explaining an
implementation example of a procedure that allows the
PD printer to issue a print job end command
(CDPS_JobEnd) to the camera in the CDPS using the PTP
10 architecture;

Fig. 26 is a chart for explaining an
implementation example of a procedure of a function
(CDPS_Error) that allows the PD printer to send error
status to the camera in the CDPS using the PTP
15 architecture;

Fig. 27 is a chart for explaining an
implementation example of a procedure that allows an
operation controller to issue a print command to a
print controller (CDPS_Job) in the CDPS using the PTP
20 architecture;

Fig. 28 is a chart for explaining an
implementation example of a procedure that allows the
operation controller to issue a print abort command to
the print controller (CDPS_JobAbort) in the CDPS using
25 the PTP architecture;

Fig. 29 is a chart for explaining an
implementation example of a procedure that allows the

operation controller to issue a print restart command

to the print controller (CDPS_JobContinue) in the CDPS

using the PTP architecture;

Fig. 30 is a chart for explaining an

5   implementation example of a procedure that allows the

print controller to issue a partial image acquisition

command to a storage (CDPS_PrintJobData) in the CDPS

using the PTP architecture;

Fig. 31 is a flow chart for explaining a partial

10   image acquisition process in the CDPS;

Fig. 32 is a chart for explaining a communication

protocol of a transition command to the CDPS in

Bluetooth;

Fig. 33 is a chart for explaining a communication

15   protocol of a transition command to the CDPS in

Bluetooth;

Fig. 34 is a chart for explaining a communication

protocol of a printer function notification process in

Bluetooth;

20   Fig. 35 is a chart for explaining a communication

protocol of a process for acquiring image data from a

storage in Bluetooth;

Fig. 36 is a chart for explaining a communication

protocol of print start notification in Bluetooth;

25   Fig. 37 is a chart for explaining a communication

protocol of print end notification in Bluetooth;

Fig. 38 is a chart for explaining a communication protocol of print job end notification in Bluetooth;

Fig. 39 is a chart for explaining a communication protocol of printer error notification in Bluetooth;

5   Fig. 40 is a chart for explaining a communication protocol of a print command issuance process in Bluetooth;

Fig. 41 is a chart for explaining a communication protocol of a print abort command issuance process in

10   Bluetooth;

Fig. 42 is a chart for explaining a communication protocol of a print job restart command issuance process in Bluetooth;

Fig. 43 is a chart for explaining a communication

15   protocol of a partial image acquisition process in Bluetooth;

Figs. 44A to 44C depict tables for explaining the support levels of the DSC and PD printer, which serve as criteria upon determining how to assign various

20   control functions (operation controller, storage controller, and print controller);

Fig. 45 depicts a view for explaining an example of a DPOF file;

Fig. 46 is a flow chart for explaining a control

25   process by the DSC according to the first embodiment of the present invention;

Fig. 47 is a flow chart for explaining a control process by the DSC according to the second embodiment of the present invention;

Fig. 48 is a flow chart for explaining a control
5   process by the DSC according to the third embodiment of the present invention;

Figs. 49A and 49B are functional block diagrams for explaining an outline of the first and second embodiments of the present invention; and

10   Fig. 50 is a flow chart for explaining a print process by a printer according to the embodiment of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

15   Preferred embodiments of the present invention will now be described in detail in accordance with the accompanying drawings.

Fig. 1 depicts a schematic perspective view of a photo direct printer apparatus (to be referred to as a
20   PD printer hereinafter) 1000 according to an embodiment of the present invention. This PD printer 1000 has a function of printing data received from a host computer (PC) as a normal PC printer, and a function of printing image data directly read from a storage medium such as
25   a memory card or the like, and printing image data received from a digital camera.

Referring to Fig. 1, a main body which forms a
housing of the PD printer 1000 according to this
embodiment has a lower case 1001, upper case 1002,
access cover 1003, and exhaust tray 1004 as exterior
5   members. The lower case 1001 nearly forms the lower
half portion of the PD printer 1000, and the upper case
1002 nearly forms the upper half portion of the main
body. By combining these cases, a hollow structure
which has a storage space that stores mechanisms to be
10   described later is formed. Openings are respectively
formed on the upper and front surfaces of the main body.
One end portion of the exhaust tray 1004 is rotatably
held by the lower case 1001, and rotation of the tray
1004 opens/closes the opening formed on the front
15   surface of the lower case 1001. For this reason, upon
making the printer execute a print operation, the
exhaust tray 1004 is rotated toward the front surface
side to open the opening. As a result, print sheets
can be exhausted from the opening, and be stacked on
20   the exhaust trays 1004 in turn. The exhaust tray 1004
stores two auxiliary trays 1004a and 1004b. When these
auxiliary trays are pulled out as needed, the loading
area of print sheets can be enlarged/reduced in three
steps.

25   One end portion of the access cover 1003 is
rotatably held by the upper case 1002 to be able to
open/close the opening formed on the upper surface of

the main body. When the access cover 1003 is opened, a
printhead cartridge (not shown), ink tanks (not shown),
or the like housed in the main body can be exchanged.
Although not shown, when the access cover 1003 is

5   opened/closed, a projection formed on the rear surface
of the cover 1003 rotates a cover open/close lever. By
detecting the rotation position of that lever using a
microswitch or the like, the open/close state of the
access cover is detected.

10   A power key 1005 is arranged on the upper surface
of the upper case 1002. A control panel 1010 which
comprises a liquid crystal display 1006, various key
switches, and the like is provided on the right side of
the upper case 1002. The structure of the control

15   panel 1010 will be described in detail later with
reference to Fig. 2. Reference numeral 1007 denotes an
automatic feeder which automatically feeds a print
sheet into the apparatus main body. Reference numeral
1008 denotes a paper gap select lever which is used to

20   adjust the gap between the printhead and print sheet.
Reference numeral 1009 denotes a card slot which
receives an adapter that can receive a memory card.
Via this adapter, image data stored in the memory card
can be directly fetched and printed. As this memory

25   card (PC), for example, a compact flash™ memory card,
smart media card, memory stick, and the like are
available. Reference numeral 1011 denotes a viewer

(liquid crystal display unit) which is detachable from
the main body of this PD printer 1000, and is used to
display an image for one frame, index image, and the
like, when the user wants to search images stored in
5   the PC card for an image to print. Reference numeral
1012 denotes a USB terminal used to connect a digital
camera (to be described later). Also, another USB
connector used to connect a personal computer (PC) is
provided on the rear surface of this PD printer 1000.

10   Fig. 2 depicts a schematic view of the control
panel 1010 of the PD printer 1000 according to this
embodiment.

        Referring to Fig. 2, the liquid crystal display
unit 1006 displays menu items used to set data
15   associated with item names printed on the right and
left sides of the unit 1006. The items printed here
include, e.g., the first photo number or designated
frame number of the images to be printed (start frame
designation/print frame designation), the last photo
20   number of the images to be printed (end), the number of
copies to be printed (copy count), the type of paper
sheet (print sheet) used in a print process (paper
type), the setup of the number of photos to be printed
per print sheet (layout), designation of print quality
25   (quality), designation as to whether or not to print a
photographing date (date print), designation as to
whether or not to print a photo after correction (image

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correction), display of the number of print sheets

required for the print process (print sheet count), and

the like. These items are selected or designated using

cursor keys 2001. Reference numeral 2002 denotes a

5   mode key. Every time this key is pressed, the type of

print (index print, all-frame print, one-frame print,

and the like) can be switched, and a corresponding one

of LEDs 2003 is turned on in accordance with the

selected type of print. Reference numeral 2004 denotes

10   a maintenance key which is used to do maintenance of

the printer (e.g., cleaning of the printhead, and the

like). Reference numeral 2005 denotes a print start

key which is pressed when the start of a print process

is instructed or when the maintenance setup is settled.

15   Reference numeral 2006 denotes a print cancel key which

is pressed when a print process or maintenance process

is canceled.

       The arrangement of principal part associated with

the control of the PD printer 1000 according to this

20   embodiment will be described below with reference to

Fig. 3. Note that the same reference numerals in Fig.

3 denote parts common to those in the above drawings,

and a description thereof will be omitted.

       Fig. 3 is a block diagram showing the arrangement

25   of principal part associated with control of the PD

printer according to the embodiment.

Referring to Fig. 3, reference numeral 3000

denotes a controller (control board). Reference

numeral 3001 denotes an ASIC (dedicated custom LSI).

The arrangement of the ASIC 3001 will be described

5   later with reference to the block diagram of Fig. 4.

Reference numeral 3002 denotes a DSP (digital signal

processor), which includes a CPU and executes various

control processes to be described later, and image

processes such as conversion from a luminance signal

10   (RGB) into a density signal (CMYK), scaling, gamma

conversion, error diffusion, and the like. Reference

numeral 3003 denotes a memory, which has a memory area

that serves as a program memory 3003a for storing a

control program to be executed by the CPU of the DSP

15   3002, a RAM area for storing a running program, and a

work area for storing image data and the like.

Reference numeral 3004 denotes a printer engine. In

this embodiment, the printer is equipped with a printer

engine of an ink-jet printer which prints a color image

20   using a plurality of color inks. Reference numeral

3005 denotes a USB connector as a port for connecting a

digital camera (DSC) 3012. Reference numeral 3006

denotes a connector for connecting the viewer 1011.

Reference numeral 3008 denotes a USB hub (USB HUB).

25   When the PD printer 1000 executes a print process based

on image data from a PC 3010, the USB hub 3008 allows

data received from the PC 3010 to pass through it, and

outputs the data to the printer engine 3004 via a USB
3021. In this way, the PC 3010 connected to the
printer can execute a print process by directly
exchanging data, signals, and the like with the printer

5   engine 3004 (the printer serves as a normal PC printer).
Reference numeral 3009 denotes a power supply connector,
which inputs a DC voltage converted from commercial AC
power by a power supply 3019. The PC 3010 is a general
personal computer. Reference numeral 3011 denotes a

10   memory card (PC card) mentioned above; and 3012, a
digital camera (to be also referred to as a DSC:
Digital Still Camera).

Note that signals are exchanged between this
controller 3000 and printer engine 3004 via the USB

15   3021 or an IEEE1284 bus 3022.

Fig. 4 is a block diagram showing the arrangement
of the ASIC 3001. In Fig. 4 as well, the same
reference numerals denote parts common to those in the
above drawings, and a description thereof will be

20   omitted.

Reference numeral 4001 denotes a PC card
interface, which is used to read image data stored in
the inserted PC card 3011, and to write data in the PC
card 3011. Reference numeral 4002 denotes an IEEE1284

25   interface, which is used to exchange data with the
printer engine 3004. This IEEE1284 interface 4002 is a
bus used when image data stored in the digital camera

3012 or PC card 3011 is to be printed. Reference

numeral 4003 denotes a USB interface, which exchanges

data with the PC 3010. Reference numeral 4004 denotes

a USB host interface, which exchanges data with the

5   digital camera 3012. Reference numeral 4005 denotes a

control panel interface, which receives various

operation signals from the control panel 1010, and

outputs display data to the display unit 1006.

Reference numeral 4006 denotes a viewer interface,

10   which controls display of image data on the viewer 1011.

Reference numeral 4007 denotes an interface, which

controls interfaces with various switches, LEDs 4009,

and the like. Reference numeral 4008 denotes a CPU

interface, which exchanges data with the DSP 3002.

15   Reference numeral 4010 denotes an internal bus (ASIC

bus), which interconnects these interfaces.

        Fig. 5 is a block diagram showing an example of

the typical arrangement of the digital camera (DSC)

3012. Note that some models of digital cameras which

20   can be connected to the PD printer 1000 of this

embodiment may not have a display unit 2700 (to be

described later.

        Referring to Fig. 5, reference numeral 3100

denotes a CPU which controls the overall DSC 3012; and

25   numeral 3101 denotes a ROM that stores the processing

sequence of the CPU 3100. Reference numeral 3102

denotes a RAM which is used as a work area of the CPU

3100; and numeral 3103 denotes a switch group used to
make various operations. The switch group 3103
includes various switches, cursor keys, and the like.
Reference numeral 2700 denotes a liquid crystal display,

5   which is used to confirm a sensed image, and to display
a menu upon making various setups. Reference numeral
3105 denotes an optical unit which mainly comprises a
lens and its drive system. Reference numeral 3106
denotes a CCD element; and numeral 3107 denotes a

10   driver which controls the optical unit 36 under the
control of the CPU 3100. Reference numeral 3108
denotes a connector that connects a storage medium 3109
(compact flash™ memory card, smart media card, or the
like); and numeral 3110 denotes a USB interface (USB

15   slave side) used to connect the PC or PD printer 1000
of this embodiment.

     This embodiment will mainly exemplify a case
wherein a print process is executed by connecting the
aforementioned PD printer 1000 and DSC 3012. This

20   embodiment has as its object to provide a PD printer
apparatus which allows an image output apparatus such
as this PD printer 1000 to connect devices (DSPD:
Digital Still Photography Devices) such as digital
cameras, cellular phones (portable phones), memory

25   devices, and the like of respective manufacturers, and
can print based on image data acquired from such
devices, and will describe communication specifications

when a print process is executed by connecting the PD printer 1000 according to this embodiment and the DSC 3012 as an example of such DSPD. Note that this embodiment proposes a novel CDPS (Canon Direct Print

5   Service) which makes communication control between the PD printer and DSC using a versatile file and versatile format, and does not depend on any interfaces.

This embodiment uses the concept of a print service function so as to make arrangements with

10   various communication architectures (e.g., PTP (Picture Transfer Protocol) of Still Image Class on USB, OBEX on Mass Storage Class or Bluetooth, UPnP, and the like) between the DSC and image output apparatus. The print service function is an aggregate of execution functions

15   in the application layer, and does not depend on various interfaces.

Also, communication control between actual image data and devices does not depend on any interfaces since it is made using a versatile file and versatile

20   format (e.g., described using an XML format).

In such system that connects the DSC and image output apparatus, its operation is made using an operation unit (e.g., switches and liquid crystal display of the digital camera or the control panel of

25   the printer) of either one of the DSC and image output apparatus. In the whole system, if two devices have similar functions, one of the devices, which is used to

instruct the other device to execute that operation,

must be determined. Hence, in the system according to

this embodiment, a scheme for determining how to assign

the operation unit and other functions between the two

5   devices is adopted after a Discovery process

(transition process; to be described later), thus

widening the versatility.

[Description of Outline of Communication]

         Fig. 6 is a chart for explaining an outline of a

10 communication between the digital camera (DSC) 3012

according to this embodiment, and the PD printer 1000

according to this embodiment as a typical example of

the image output apparatus. Note that the DSC 3012 and

PD printer 1000 are connected via USB, and a

15 communication between them uses PTP. In this USB

connection, the PD printer 1000 serves as the host side,

and the DSC 3012 serves as the slave side.

         This procedure will be described in turn below.

Note that a case will be exemplified below wherein the

20 DSC 3012 has the arrangement shown in Fig. 5 above, and

is used to set auxiliary print conditions in a print

process and issue a print start instruction.

         (1) Initially, the DSC 3012 and PD printer 1000

are physically connected using a USB cable.

25   (2) A USB host controller (USB task) of the PD

printer 1000 recognizes the DSC 3012, and establishes

connection in Image Class/PTP. This state corresponds
to "establish communication" 600 in Fig. 6.

(3) Next, a process (601) for shifting the
control to the communication specifications (CDPS)
5   defined by this embodiment starts. At this time, it is
confirmed and determined whether or not the CDPS
service can be implemented between the DSC 3012 and PD
printer 1000, based on information exchanged between
them. If the service can be implemented, it is
10 determined (610) whether the service is implemented in
a "standard" or "extended" procedure. Also, in this
process 601, it is determined which of the DSC 3012 and
PD printer 1000 is used to determine a print image, to
set print conditions, to issue a print start
15 instruction, and so forth.

(4) When the service is implemented in a
"standard" procedure 602 as a result of the process 601,
the PD printer 1000 notifies the DSC 3012 of "services
that the printer side can provide" (603). More
20 specifically, paper sizes, paper types, print qualities,
combinations that allow layouts, and the like are
notified.

(5) The DSC 3012 generates a UI menu to be
operated by the user in accordance with the service
25 contents received in 603, and displays it on the
display unit 2700. As a result, the user makes setups
of a print image and selection of a photo (which will

be generally referred to as a "job" hereinafter) via
the UI menu (611).

(6) Upon completion of "job" setups in this way,
when the user issues a print start instruction at the
5   DSC 3012, the DSC 3012 sends a "job" to the PD printer
1000 (604).

(7) The PD printer 1000 sets up itself in
accordance with the contents of the "job" received in
604, and acquires a required image file from the DSC
10   3012 (605) to print a photo (613).

(8) If an error has occurred in the PD printer
1000 during execution of the "job", the PD printer 1000
notifies the DSC 3012 of the contents of the error that
has occurred so as to demand the user to take an action
15   (606) (to select "continue/abort print" in this
embodiment). When the user determines an action to be
taken using the UI of the DSC 3012 (612), the
determined contents are sent to the PD printer 1000 to
execute a corresponding error process 614.

20   (9) When the "job" is completed by repeating
transfer of an image file and a print process (→
transmit/receive errors) in this way, the DSC 3012 is
set in a "job" setting state again.

(10) When it is determined in 610 above that the
25   service is to be implemented in the CDPS "extended
procedure", a procedure and "extended" process (607)
unique to each vendor are executed. Since the process

in the "extended procedure" is specified by each vendor,
a description thereof will be omitted.
[Hierarchical Structure]

     Fig. 7 depicts the hierarchical structure of
5   functions when the DSC 3012 and the PD printer 1000 as
a typical image output apparatus are connected.

     Referring to Fig. 7, reference numerals 700 and
703 denote applications; and numerals 701 and 702
denote physical layers as an example of USB and
10   Bluetooth. The DSC 3012 and PD printer 1000 can build
the CDPS system of this embodiment by respectively
installing the applications 700 and 703. Note that
this system is premised on installation of
architectures such as PTP of the protocol layer, file
15   systems on BIP and MSC (Mass Storage Class), and the
like, as shown in the layers 701 and 702. Also, the
substance of this print service function is present in
the applications 700 and 703, and the print service
function is executed in modules for converting from the
20   CDPS into respective protocols.

     In this way, the direct print service can be
implemented independently of any physical interfaces.
[Function of Overall System]

     Fig. 8 depicts a diagram showing the functional
25   arrangement when the connected DSC 3012 and PD printer
1000 are considered as an integrated system.

After the aforementioned hierarchical structure specifies that the system does not depend on any interfaces, elements (objects) of higher levels are defined so as to realize independence from "functions"

5   of DSPDs and the image output apparatus. In this embodiment, various functions are not separated or exclusively assigned between the DSC 3012 and PD printer 1000, and the functional arrangement and objects required for the whole direct print system are

10 defined. Functions and roles will be explained below.

In this embodiment, the functions of the whole system are roughly classified into four functions (800 to 803).

<CDPS Initialize Process (CDPS Initialize) 800>

15   A CDPS initialize process 800 is launched first prior to other CDPS functions. This process checks transition (standard/extended) to a CDPS mode and the like, and sends the checking result to respective functions as "Service Discovery" 804. This process

20 corresponds to 601 in Fig. 6 above.

<Operation Control (Operation Controller) 801>

Management (Operation Controller) 801 of the UI that interacts with a user 812 is launched upon reception of "ServiceDiscovery" 804 from the CDPS

25 initialize process 800. This operation controller 801 acquires services "Service" 807 that can be printed by a print device 810 (printer engine 3004) from print

control (Print Controller) 803, and acquires an image information list "DataList" 805 held by a storage device 811 (e.g., the PC card 3011) from storage control (Storage Controller) 802. The operation

5   controller 801 generates a UI menu based on the descriptions of these "Service" 807 and "DataList" 805. The operation controller 801 generates an output setting instruction "Job" 808 on the basis of user's instructions input via the UI menu generated in this

10   way, and sends it to the print controller 803.

<Storage Control (Storage Controller) 802>

The storage controller 802 manages a storage medium (e.g., the PC card 3011) that holds photo images. This storage controller 802 is launched upon reception

15   of "ServiceDiscovery" 804 from the CDPS initialize process 800. The storage controller 802 generates the image information list "DataList" 805 held in the storage device 811 in accordance with a request from the operation controller 801, and sends it to the

20   operation controller 801. Also, the storage controller 802 outputs an image file "JobData" 806 saved in the storage device 811 to the print controller 803 in accordance with a request from the print controller 803.

<Print Control (Print Controller) 803>

25   The print controller 803 manages the print device 810 that prints a photo image. This print controller 803 is launched upon reception of "ServiceDiscovery"

804 from the CDPS initialize process 800, and sends
services "Service" 807 that can be printed by the print
device 810 to the operation controller 801. Upon
acquisition of an output setting instruction "Job" 808

5   from the operation controller 801, the print controller
803 requests the storage controller 802 of an image
file "JobData" 806 saved in the storage device 811 on
the basis of the description of that "Job" 808 using a
description method described in the "DataList" 805, and

10   acquires that image file. The print device 801
generates print data that can be processed, and outputs
it to the print device 810, thus printing an image.

        Fig. 9 is a flow chart for explaining the flow of
processes by the respective functions in Fig. 8.

15   In step S1, the CDPS initialize process 800
checks if the system can transit to the CDPS mode, and
sends "ServiceDiscovery" 804 to the respective
functions based on the checking result, thus launching
the respective functions. The flow then advances to

20   step S2, and the print controller 803 print services
"Service" 807 that the print device 810 can provide to
the operation controller 801. The flow advances to
step S3, and the operation controller 801 acquires an
image information list "DataList" 805 held in the

25   storage device 811 from the storage controller 802.
The flow advances to step S4, and the operation
controller 801 forms and displays a print setting UI on

the basis of "Service" 807 and "DataList" 805. The
operation controller 801 generates print setting
instructions "Job" 808 that specify images to be
printed, selection of their print modes, and the like

5   on the basis of instructions of the user 812 input
according to this UI, and sends the generated "Job" 808
to the print controller 803. The flow advances to step
S5, and the print controller 803 makes print setups of
the print device 810 according to the description of

10 "Job" 808. The print controller 803 requests the
storage controller 802 of an image file "JobData" 806,
which is held in the storage device 811 and is required
for a print process, using a description method
described in "DataList" 805, and acquires that image

15 file. Then, the print controller 803 generates print
data that can be processed by the print device 810.
The flow advances to step S6, and the print controller
803 outputs the print data to the print device 810 to
print an image. It is checked in step S7 if an end

20 instruction of the print process is designated. If no
end instruction is designated, the flow returns to step
S4 to repeat the aforementioned processes. If the end
instruction of the print process is designated, this
process ends.

25   As described above, the aforementioned
hierarchical structure, four functions 800 to 803, and
five information groups 804 to 808 exchanged among the

four functions form the CDPS basic configuration
despite of the locations of the aforementioned
functions (DSC 3012 or PD printer 1000).
[CDPS Configuration by DSC and PD Printer]

5   Fig. 10 shows an example of the CDPS
configuration while the DSC 3012 and PD printer 1000
are connected. Fig. 10 shows a case wherein both the
DSC 3012 and PD printer 1000 hold the aforementioned
four functions 800 to 804. In this case, the storage

10   device 811 and print device 810 are logically located
outside this CDPS system, and the side to which these
devices are connected is not fixed.

The CDPS of this embodiment is characterized in
that after the DSC 3012 and PD printer 1000 are

15   physically and logically connected, the CDPS initialize
(CDPS Initialize) processes 800 of the DSC 3012 and PD
printer 1000 interactively determine which of the DSC
3012 and PD printer 1000 handles and manages each of
the three remaining functions 801 to 803, and the

20   processing functions of the storage device 811 and 810.

Fig. 11 is a flow chart for explaining the
function assignment process in the CDPS of this
embodiment.

In step S11, the DSC 3012 notifies the PD printer

25   1000 of the support levels of its functions 800 to 803.
The flow advances to step S12, and the PD printer 1000
compares the support levels of the respective functions

received from the DSC 3012 with those of the PD printer

1000 itself to detect in which of the DSC 3012 and PD

printer 1000 functions with higher usability are

installed and to determine the DSC 3012 or PD printer

5   1000 to which each of the functions is to be assigned.

The flow advances to step S13, and the PD printer 1000

sends the determined handle information and management

information of the respective functions to the DSC 3012.

The flow advances to step S14, and the DSC 3012 and PD

10   printer 1000 respectively launch functions determined

to be handled by them. In step S15, the CDPS is

started.

If the "extended procedure" is to be executed, it

is executed after it is determined in step S12 that

15   both the DSC 3012 and PD printer 1000 support the

extended procedure. However, since the subsequent

interactions are unique to each vendor, a description

thereof will be omitted.

The respective functions need not always be

20   supported by both the DSC 3012 and PD printer 1000, but

they must be supported by either the DSC 3012 or PD

printer 1000. Especially, as for the CDPS initialize

process 800, even if the DSC 3012 does not support the

CDPS initialize process 800, the CDPS initialize

25   process 800 of the PD printer 1000 allows this system

to transit to the CDPS mode depending on the connection

state of the interface.

[CDPS Configuration Example-1]

Fig. 12 depicts a configuration example 1 of the
CDPS when the DSC 3012 and PD printer 1000 are
connected via PTP (Picture Transfer Protocol) of Image
5   Class on USB. The same reference numerals in Fig. 12
denote parts common to those in Figs. 8 and 10, and a
description thereof will be omitted. Note that a case
will be explained below wherein the DSC 3012 which
comprises the liquid crystal display 2700 and the PD
10   printer 1000 to which no liquid crystal viewer 1011 is
attached are connected. That is, in this example, the
DSC 3012 comprises the CDPS initialize process 800,
operation controller 801, and storage controller 802,
and the PD printer 1000 comprises the functional
15   arrangement shown in Fig. 10.

In this case, the CDPS initialize process 800 of
the PD printer 1000 makes an attempt to exchange
information about assignment and management of the
respective functions with that of the DSC 3012. In
20   response to this, the DSC 3012 informs the PD printer
1000 that it supports the functions of the operation
controller 801 and storage controller 802 (with the
liquid crystal display 2700 and the like). The CDPS
initialize process 800 of the PD printer 1000 compares
25   these support levels with those of the operation
controller 801 and storage controller 802 (without the
liquid crystal viewer and the like) of the PD printer

1000, and determines the system configuration as
follows. Then, "CDPS transition OK" is sent back to
the CDPS initialize process 800 of the PD printer 1000,
and the following determination contents are sent to

5   the DSC 3012.

    (1) The DSC 3012 handles and manages the
operation controller 801 and storage controller 802.

    (2) The PD printer 1000 handles and manages the
print controller 803.

10   (3) The storage device 811 is mounted on the DSC
3012, and the storage controller 802 of the DSC 3012
manages this storage device 811.

    (4) The print device 810 (printer engine 3004)
is provided in the PD printer 1000, and the print

15   controller 803 of the PD printer 1000 manages a print
process. Note that the above process is similarly
executed when the DSC and PD printer are connected via
other interfaces such as TCP/IP of Wireless LAN and the
like.

20   [CDPS Configuration Example-2]

    Fig. 13 shows configuration example 2 of the CDPS
when the DSC 3012 and PD printer 1000 are connected via
PTP (Picture Transfer Protocol) of Image Class on USB.
The same reference numerals in Fig. 13 denote parts

25   common to those in Figs. 8 and 10, and a description
thereof will be omitted. Note that a case will be
explained below wherein the DSC 3012 which does not

comprise any liquid crystal display 2700 and the PD

printer 1000 to which the liquid crystal viewer 1011 is

attached are connected, or the DSC 3012 does not

comprise any CDPS initialize process 800. Note that

5   the PD printer 1000 comprises the functional

arrangement shown in Fig. 10.

Upon examining a case wherein the CDPS initialize

process 800 of the PD printer 1000 makes an attempt to

exchange information about assignment and management of

10   the respective functions with that of the DSC 3012, the

DSC 3012 cannot respond to this since it has no CDPS

initialize process 800. Hence, a PTP Wrapper layer of

the PD printer 1000 determines the system configuration

as follows, and sends "CDPS transition OK" back to the

15   CDPS initialize process 800 of the PD printer 1000.

(1) The PD printer 1000 handles and manages all

of the operation controller 801, storage controller 802,

and print controller 803.

(2) The storage device 811 is provided in the

20   DSC 3012, and the storage controller 802 of the PD

printer 1000 manages image accesses to this storage

device 811 via standard PTP.

(3) The print device 810 is provided in the PD

printer 1000, and the print controller 803 of the PD

25   printer 1000 manages it.

Note that the configuration shown in Fig. 13 is

determined not only when the DSC 3012 does not have any

CDPS initialize process 800, but also when the CDPS

initialize process 800 of the PD printer 1000

determines that the resolution and operability of the

display 2700 of the DSC 3012 are inferior to those of

5   the viewer 1011 of the PD printer 1000 or the UI that

uses that viewer 1011 even when the DSC 3012 comprises

the display 2700.

[CDPS Configuration Example-3]

Fig. 14 depicts a configuration example 3 of the

10   CDPS upon connection via MSC (Mass Storage Class). The

same reference numerals in Fig. 14 denote parts common

to those in Figs. 8 and 10, and a description thereof

will be omitted. Note that a case will be explained

below wherein the DSC 3012 which does not comprises any

15   liquid crystal display 2700 is connected as MSC, to the

PD printer 1000 to which the liquid crystal viewer 1011

is attached.

In this case, the CDPS initialize process 800 of

the PD printer 1000 makes an attempt to exchange

20   information about assignment and management of the

respective functions with that of the DSC 3012.

However, it is difficult for standard bulk-only MSC to

exchange information with the DSC 3012 in two ways.

For this reason, a Mass Storage Class Wrapper layer 820

25   of the PD printer 1000 determines the system

configuration as follows, and sends "CDPS transition

OK" back to the CDPS initialize process 800 of the PD

printer 1000.

    (1) The PD printer 1000 handles and manages all

of the operation controller 801, storage controller 802,

5 and print controller 803.

    (2) The storage device 811 is provided in the

DSC 3012, and the storage controller 802 of the PD

printer 1000 manages image accesses to this storage

device 811 as standard MSC.

10   (3) The print device 810 is provided in the PD

printer 1000, and the print controller 803 of the PD

printer 1000 manages it.

[CDPS Output Procedure]

    The output procedure in the CDPS according to

15 this embodiment has the following two procedures.

<Standard Procedure>

    In the CDPS according to this embodiment, a

procedure according to the following functions and

information is defined.

20   •CDPS Initialize function

     •Operation Controller function

     •Storage Controller function

     •Print Controller function

     •Service Discover information

25   •Service information

     •Job information

     •Job Data information

<Extended Procedure>

Procedures that can cope with outputs in various formats based on specifications unique to respective vendors are defined for the following formats.

5 •XHTML

•SVG

•Unique format

[Description of CDPS Function]

In the CDPS of this embodiment, print service

10 functions shown in Figs. 15A and 15B are provided so as to allow the PTP upper layers of both the DSC 3012 and PD printer 1000 to arbitrarily handle applications, i.e., to model functions between the DSC 3012 and PD printer 1000 (for example, a print process requires

15 exchange of various PTP protocols such as exchange of objects and the like). The aforementioned application layers 700 and 703 in Fig. 7 can basically implement direct print using the print service functions shown in Figs. 15A and 15B. Note that the print service

20 functions include indispensable functions (Fig. 15A) and an optional function (Fig. 15B), and an apparatus which supports the CDPS must prepare for all the indispensable functions of them.

Figs. 15A and 15B show a list of service

25 functions in the CDPS according to this embodiment. These functions will be explained in turn below.

(a) CDPS_ServiceDiscovery (Initialization)

This function makes transition to the CDPS. The
return value of this function designates the "standard"
or "extended" procedure of the CDPS using a script, and
information indicating which procedure is selected is

5   received. Note that only the CDPS_ServiceDiscovery
function is used in the "extended" procedure.

(b)   CDPS_Service (Printer → Operation Controller)

This function notifies a script that describes
the functions of the PD printer as a parameter. The

10   script that describes the functions of the PD printer
is used as an argument, and its return value indicates
a communication result, i.e., success/failure of a
communication ("TRUE" or "FALSE").

(c)   CDPS_PageStart (Printer → Operation Controller)

15   This function notifies print start (for each
page). Its parameter is a script that describes the
print function, and its return value indicates a
communication result, i.e., success/failure of a
communication ("TRUE" or "FALSE").

20   (d)   CDPS_PageEnd (Printer → Operation Controller)

This function notifies print end (upon
discharging a sheet for each page). Its parameter is a
script that describes the print function, and its
return value indicates a communication result, i.e.,

25   success/failure of a communication ("TRUE" or "FALSE").

(e)   CDPS_JobEnd (Printer → Operation Controller)

This function notifies end of a print job. Its parameter is a script that describes the print function, and its return value indicates a communication result, i.e., success/failure of a communication ("TRUE" or

5 "FALSE").

(f) CDPS_Error (Printer → Operation Controller)

This function notifies an error (Warning/Fatal). Its parameter is a script that describes the print function, and its return value indicates a

10 communication result, i.e., success/failure of a communication ("TRUE" or "FALSE").

(g) CDPS_JobData (Printer → Storage)

This function acquires an image (e.g., JPEG data) from the storage. A script that describes a handle

15 name of image data to be acquired is used as an argument, and its return values are the number of bytes of the acquired image data and the image data itself.

(h) CDPS_DataList (Printer → Storage)

This function acquires a list of image

20 information (e.g., JPEG data) from the storage. A script that describes the function of the PD printer as an argument, and its return value is a script that describes an image data list.

(i) CDPS_Job (Operation Controller → Printer)

25 This function notifies the printer of a print command. A script that describes a print command is used as an argument, and its return value indicates a

communication result, i.e., success/failure of a
communication ("TRUE" or "FALSE").

(j)   CDPS_JobAbort (Operation Controller → Printer)

      This function notifies the printer of a print
abort command.   A script that describes the printer
function is used as an argument, and its return value
indicates a communication result, i.e., success/failure
of a communication ("TRUE" or "FALSE").

(k)   CDPS_JobContinue (Operation Controller → Printer)

      This function notifies the printer of a print
restart command.   A script that describes the printer
function is used as an argument, and its return value
indicates a communication result, i.e., success/failure
of a communication ("TRUE" or "FALSE").

      These functions are the indispensable functions
in the CDPS.

      The CDPS of this embodiment further comprises a
CDPS_PartialJobData function as an optional function,
as shown in Fig. 15B.

      This CDPS_PartialJobData is a function of
allowing the printer to acquire partial image data
(e.g., JPEG data) from the storage.   A script that
describes a handle name of partial image data to be
acquired is used as an argument, and its return values
are the number of bytes of the acquired image data and
the image data itself.   Note that a DPOF designation
command that designates to receive a DPOF file, to

interpret that DPOF file, and to execute a print

process designated by that DPOF is prepared in addition

to the above function.

[Description of Script Format]

5   The contents of the script used in the

aforementioned service discovery

(CDPS_ServiceDiscovery) function and the formats of

scripts used in other functions will be described below.

<Formats of Various Function Commands>

10 · (1) Script Format of Service Discovery

(CDPS_ServiceDiscovery)

        This format describes the contents (described in

UniCode) of the script used in the service discovery

(CDPS_ServiceDiscovery) function, and is used upon

15   transition to the CDPS mode. With this script, each

others' keywords are recognized.

        CanonDirectPrintService(UILevel=X) (device

information, UI level information (X) = 0 to 4)

CanonDirectPrintService(HostUI) (when the UI of the

20   host (PD printer) is used) or

CanonDirectPrintService(DeviceUI) (when the UI of the

device (DSC) side is used)

(2) Script Format in CDPS_PageStart, CDPS_PageEnd,

CDPS_JobEnd, CDPS_DataList, CDPS_JobAbort, and

25   CDPS_JobContinue

        <?XML version="1.0" encoding=UTF-16"?>

```
<!ELEMENT command("CDPS_PageStart" | "CDPS_PageEnd" |
"CDPS_JobEnd" | "CDPS_JobAbort" | "CDPS_JobContinue")>
(3)  Script Format of CDPS_Service
<?XML version="1.0" encoding=UTF-16"?>
<command(CDPS_Service)>
<capability>
<--describe Printer Capability-->
</capability>
(4)  Script Format of CDPS_Job
<?XML version="1.0" encoding=UTF-16"?>
<command(CDPS_Service)>
<job>
<capability>
<--describe Printer Capability(PrintMode)-->
</capability>
<printlist>
<--describe additional information such as Image File
Handle, date, and the like-->
</printlist>
</job>
(5)  Script Format of CDPS_Error
<?XML version="1.0" encoding=UTF-16"?>
<command(CDPS_Error)>
<!ELEMENT status ("fatal" | "warning")>
<!ELEMENT reason ("printer_occupied" | "printer_busy" |
"ink_low" | "lever_error" | "load_error" | ...)>
```

Note that "status" describes whether or not this

error is an error that allows recovery to the job. For

example, "fatal" indicates a non-recoverable error,

"warning indicates a recoverable error. Also, "reason"

5   describes the cause of that error.

(6) Script Format of CDPS_JobData and

CDPS_PartialJobData

<?XML version="1.0" encoding=UTF-16"?>

<!ELEMENT command("CDPS_JobData" |

10   "CDPS_PartialJobData")><image (#PCDATA)>

<offset (#PCDATA)>

<size (#PCDATA)>

Note that "image" describes the handle name of a

file, "offset" describes the number of bytes of an

15   offset from the head, and "size" describes the number

of bytes of image data to be acquired. However, in

case of CDPS_JobData, these "offset" and "size" are

disabled if partial acquisition as the optional

function is not used.

20   <Format of Capability>

The format of <capability> used in the

CDPS_Service and CDPS_Job functions will be described

below.

<capability>

25   <--[item that does not require negotiation]-->

```
<!ELEMENT quality ("draft" | "normal" |
"fine")><!ELEMENT paper_size ("L" | "2L" | "card" |
"4×6" | "A4" | "letter" | ...)>
<!ELEMENT paper_type ("plain" | "photo")>
```

5   Note that "quality" represents the print quality,
and designates one of "quick (draft)", "normal", and
"fine". "paper_size" represents the paper size (L, 2L,
card, 4×6, A4, letter size, and the like), and
"paper_type" represents the type of paper sheet and

10   designates one of "plain paper (plain)" and "photo
dedicated paper (photo)".

```
<--[item that requires negotiation]-->
<!ELEMENT image_type ("bmp" | "jpeg" | "tiff"
| ...)><!ELEMENT date ("on" | "off")>
```

15   ```
<!ELEMENT file_name ("on" | "off")>
<!ELEMENT image_optimize ("on" | "off")>
<size_per_page (#PCDATA)>
<!ATTLIST layout L ("borderless" | "1×1" | ... |
"index(3×5)") "borderless" 2L ("borderless" | "1×1"
```

20    ```
| ... | "index(5×7)") "borderless" ...>
```

Note that "image_type" represents the image
formats which are supported. "date" indicates ON/OFF
of a date print function. "file_name" indicates ON/OFF
of a file name print function, and "image_optimize"

25   indicates ON/OFF of image correction. "size_per_page"
represents the size of image data that can be read, and

"layout" indicates layouts which are available for

various paper types.

```
<option>

<!ATTLIST vendor image_optimize ("DiPS" | "auto" | ...)

"auto" trimming_x (#PCDATA) "0"

trimming_y (#PCDATA) "0"

trimming_w (#PCDATA) "0"

trimming_h (#PCDATA) "0"

...>

</option>

</capability>
```

Note that a field bounded by this "option"

represents Printer Capability unique to each vendor,

and describes the contents together with the vendor

name.

<Job Format>

The format of <job> used in the CDPS_Job function

will be described below.

```
<job>

<capability>

<--aforementioned Capability Format-->

</capability>

<printlist>

<image (#PCDATA)>

<date (#PCDATA)>

<file_name (#PCDATA)>

<--repeat image, data, and file_name above-->
```

```
</printlist)

</job>
```

Note that a field bounded by "capability" represents the print setups of images that follow this field. Also, a field bounded by "printlist" represents images, additional information (date, file name), and the like to be printed in this job.

<Practical Example of Job Format> .

Practical examples of this Job format will be explained below.

(A) Print image of Handle1 on L-size photo paper together with date in borderless style

```
<?XML version="1.0" encoding=UTF-16"?>

<command(CDPS_job)>

<job>

<capability>

<papersize("L")>: paper size (L size)

<papertype("Photo")>: photo paper

<date("on")>: date print = ON

<layout("borderless")>: borderless print

</capability>

<printlist>

<image("handle1")>: image of Handle1

<date("2002/05/30"): date (May 30, 2002)

</printlist>

</job>
```

(B) Print six images of Handle1 to Handle6 on L-size

photo paper in 2 × 2 layout

```
<?XML version="1.0" encoding=UTF-16"?>

<command(CDPS_job)>
```

5   `<job>`

```
<capability>

<papersize("L")>: paper size (L size)

<papertype("Photo")>: photo paper

<date("off")>: date print = OFF
```

10   `<layout("2×2")>: layout 2 × 2`

```
</capability>

<printlist>

<image("handle1")>

<image("handle2")>
```

15   `<image("handle3")>`

```
<image("handle4")>

<image("handle5")>

<image("handle6")>: designate images of Handle1 to
```

Handle6

20   `</printlist>`

```
</job>
```

(C) Print based on image selection and paper

size/layout setup based on DPOF file designated by

Handle1

25   `<?XML version="1.0" encoding=UTF-16"?>`

```
<command(CDPS_job)>

<job>
```

```
<printlist>

<image("handle1")>: Handle1 = DPOF file

</printlist>

</job>
```

5   (D) Print based on photo selection and setup based on

DPOF file designated by Handle1 on L-size photo paper

in 2 × 2 layout

```
<?XML version="1.0" encoding=UTF-16"?>

<command(CDPS_job)>
```

10   `<job>`

```
<capability>

<papersize("L")>: paper size (L size)

<papertype("Photo")>: photo paper

<date("off")>: date print = OFF
```

15   `<layout("2x2")>: layout 2 × 2`

```
</capability>

<printlist>

<image("handle1")>: Handle1 = DPOF file

</printlist>
```

20   `</job>`

[Description of Flow of CDPS "Standard" Procedure]

      Fig. 16 is a diagram for explaining the flow of

basic processes in the CDPS according to this

embodiment. In Fig. 16, CDPS functions exchanged among

25   the aforementioned functions 800 to 803 are

time-serially listed from top down. In Fig. 16,

positions "A", "B", "C", and "D" on the broken lines

indicate separation positions of function assignment,
which seem typical. Also, the same reference numerals
in Fig. 16 denote parts common to those in Fig. 8 above,
and a description thereof will be omitted.

5   When the aforementioned CDPS initialize process
800 of the PD printer 1000 notifies the DSC 3012 of
transition to the CDPS mode (804), the DSC 3012 informs
the PD printer 1000 of levels ("standard", "extended",
and supported functions) (821) supported by the DSC
10   3012 in response to that notification. Based on these
levels, the PD printer 1000 determines which of the DSC
3012 and PD printer 1000 implements each of the
aforementioned functions 800 to 803, and sends the
determination result to the DSC 3012 (822).

15   Reference numeral 823 denotes a request of a data
list of image data stored in the storage device 811,
which is sent from the operation controller 801 to the
storage controller 802; and numeral 824 denotes data
read out from the storage device 811 by the storage
20   controller 802 in response to that request. Then, the
storage controller 802 sends the list data to the
operation controller 801 (805). A print mode and an
image to be printed are selected by the operation of
the user 812 to generate a print job, which is sent to
25   the operation controller 801 (825). The operation
controller 801 generates an output setting instruction
"CDPS_Job" based on instructions of the user 812 input

via the generated UI menu, and sends it to the print

controller 803 (808). The print controller 803

requests the storage controller 802 of that image data

(826). As a result, image data is read out from the

5   storage device 811 (827), and an image file "JobData"

required for a print process is sent from the storage

controller 802 to the print controller 803 (806). The

print controller 803 executes an image process and the

like to generate print data, and sends that print data

10   to the print device 810 to execute the print process

(828).

          If an error has occurred during the print process,

error information is sent from the print controller 803

to the operation controller 801 (829). If the user

15   designates "print abort" or "print continue" with

respect to this error (831), for example, a "print

abort" command is sent from the operation controller

801 to the print controller 803 in correspondence with

that designation (830) (this command is shown in Fig.

20   15A). The print controller 803 notifies the operation

controller 801 of the end of the print job (832).

          Fig. 17 is a diagram for explaining a case

wherein the DSC 3012 handles the operation controller

801 and storage controller 802, and the PD printer 1000

25   handles the print controller 803. In this case, the

separation position of function assignment is "C" in

Fig. 16 above. Note that PTP connection is exemplified

in this case. However, the same applies to TCP/IP
connection or the like if the operation controller 801
and storage controller 802 of the DSC 3012 are used.

In this case, the PD printer 1000 informs that
5   the DSC 3012 implements the operation controller 801
and storage controller 802 of the functions 800 to 803,
and the PD printer 1000 implements the print controller
803 (822). As a result, the function assignment
between the DSC 3012 and PD printer 1000 is determined,
10 as shown in Fig. 17. In Fig. 17, the same reference
numerals denote processes common to those in Fig. 16,
and a description thereof will be omitted.

Fig. 18 is a diagram for explaining a case
wherein the storage device 811 of the DSC 3012 is used
15 as Mass Storage", and the PD printer 1000 handles the
operation controller 801, storage controller 802, and
print controller 803. In this case, the separation
position of function assignment is "A" in Fig. 16 above.
Note that PTP connection is exemplified in this case.
20 However, the same applies to TCP/IP connection or the
like if the operation controller 801 and storage
controller 802 of the DSC 3012 are used.

In this case, the PD printer 1000 informs that
the printer 1000 implements all of the functions 800 to
25 803 (822). As a result, the function assignment
between the DSC 3012 and PD printer 1000 is determined,
as shown in Fig. 18. In Fig. 18, the same reference

numerals denote processes common to those in Fig. 16,

and a description thereof will be omitted.

Note that the same applies to other connections

such as PTP and the like if the resources of the DSC

5   3012 are not used at all. Also, the same applies to

the case wherein the DSC 3012 has no CDPS initialize

function 800 (CDPS Initialize) (a model which is

incompatible to the CDPS).

Implementation examples of the aforementioned

10   service function commands in the CDPS will be explained

below.

[Implementation Example of Print Service Function by

PTP]

<CDPS Service Discovery (CDPS_ServiceDiscovery)

15   Function>

Fig. 19 depicts a chart for explaining the

procedure of the CDPS discovery procedure.

When the PD printer 1000 and DSC 3012 are

physically connected, and the system enters in the PTP,

20   the PD printer 1000 transmits GetDeviceInfo to the DSC

3012 (1400) to request it to send information

associated with objects held by the DSC. In response

to this command, the DSC 3012 transmits information

associated with objects held by itself to the PD

25   printer 1000 using DeviceInfoDataSet. The PD printer

1000 issues a start request of a procedure for

assigning the DSC 3012 as a resource and to assign

handles to data objects as needed, and for executing a
special initialization process using OpenSession (1402).
If the DSC 3012 returns an affirmative response (OK), a
PTP communication starts. When the PD printer 1000
5   requests the DSC 3012 to send all handles in a script
format (Storage ID: FFFFFF, Object Type: Script) (1403),
the DSC 3012 returns all handle lists held by it (1404).
The PD printer 1000 acquires information of the i-th
object handle (1405, 1406). If this object contains a
10 keyword (e.g., "(Marco)") indicating identification of
the DSC 3012, transmission of object information from
the PD printer 1000 is designated (SendObjectInfo)
(1407). Upon reception of an affirmative response (OK)
in response to this designation, the PD printer 1000
15 transmits object information to the DSC 3012 using
SendObject. Note that this object contains, e.g.,
"(Polo)" as a response keyword to the aforementioned
keyword.

In this manner, the PD printer 1000 and DSC 3012
20 can recognize each other's connection partners and,
after that, the CDPS procedure can start. The
transport layer that can exchange files in this way can
reliably exchange keywords. That is, keywords can be
exchanged without adding unique commands or the like to
25 the CDPS of this embodiment. Note that the keywords
are not limited to the aforementioned examples, and an
identical keyword may be used. In order to shorten the

negotiation time using keywords, the time required to

confirm each others' devices can be shortened by

setting the keyword in the first handle (i = 1) in the

script format.

5   Fig. 20 is a chart for explaining the subsequent

part of the CDPS_ServiceDiscovery procedure.

The PD printer 1000 informs the DSC 3012 of the

presence of object information to be sent to it using

SendObjectInfo (1501) so as to notify the procedures

10   "standard procedure" and "extended procedure" that the

PD printer 1000 supports. Upon reception of an

affirmative response (OK) from the DSC 3012 in response

to this command, the PD printer sends a message

indicating that it is ready to transmit an object to

15   the DSC 3012 using SendObject (1502), and then

transmits information ("standard"/"extended")

associated with the procedures supported by the PD

printer 1000 using ObjectData (1503). The DSC 3012

sends to the PD printer 1000 a message indicating that

20   it wants to launch a GetObject operation (transit to

the push mode) (1504). In response to this message,

when the PD printer 1000 sends a message indicating

that it is ready to receive information associated with

object information (GetObjectInfo) (1505), the DSC 3012

25   sends the object information to the PD printer 1000

using ObjectInfoDataset (1506). When object

information itself is requested by designating that

object information (1507), the DSC 3012 informs the PD

printer 1000 of procedures ("standard", "extended", and

the like) that the DSC 3012 uses by Object Dataset

(1508). The return value in this case is "standard" or

5   "extended".

In this manner, the DSC 3012 can designate an

image print mode of the PD printer 1000.

<CDPS_Service (standard)>

Fig. 21 is a chart for explaining the printer

10   function notification procedure in the CDPS according

to this embodiment.

In this procedure, the PD printer 1000 informs

the DSC 3012 of the presence of object information to

be sent to it (1600), and notifies the DSC 3012 of the

15   printer functions using SendObject and ObjectData. As

a result, the DSC acquires the printer functions (1601).

<CDPS_JobData (standard)>

Fig. 22 is a chart for explaining an

implementation example, using the PTP architecture, of

20   the communication procedure when the PD printer 1000

acquires image data (JPEG image) held in the DSC 3012

(CDPS_JobData) in the CDPS according to this embodiment.

When the PD printer 1000 requests the DSC 3012 of

information associated with an object held by the DSC

25   3012 (or storage) (1800), the DSC 3012 sends

information (Object Dataset) associated with that

object to the PD printer 1000 (1801). When the PD

printer 1000 issues an acquisition request (GetObject)
by designating that object (1802), the DSC 3012
transmits the requested image file (Object Dataset) to
the PD printer 1000 (1803). In this way, the PD

5   printer 1000 can acquire a desired image file from the
DSC 3012. In this case, the return values in this case
are "Data_Size" and "Image_Data".

<CDPS_PageStart (standard)>

Fig. 23 is a chart for explaining the procedure

10   of the print start notification process in the CDPS
according to this embodiment.

In this procedure, the PD printer 1000 informs
the DSC 3012 of the presence of object information
(print start message) to be sent to it (1700), and

15   notifies the DSC 3012 of print start using SendObject
and ObjectData (1701).

<CDPS_PageEnd (standard)>

Fig. 24 is a chart for explaining an
implementation example, using the PTP architecture, of

20   the communication procedure that allows the PD printer
1000 to notify the DSC 3012 of a print process for one
page in the CDPS according to this embodiment.

In this procedure, the PD printer 1000 notifies
the DSC 3012 of the presence of object information

25   (print end message) to be sent to it (1910), and
notifies the DSC 3012 of print end for one page using
SendObject and ObjectData (1911).

<CDPS_JobEnd (standard)>

Fig. 25 is a chart for explaining an
implementation example, using the PTP architecture, of
the communication procedure that allows the PD printer
5   1000 to notify the DSC 3012 of the end of a print job
in the CDPS according to this embodiment.

The PD printer 1000 notifies the DSC 3012 of the
end of a print process for one page (1920), and
notifies the DSC 3012 of the end of a print job (1921).
10 <CDPS_Error (standard)>

Fig. 26 is a chart for explaining an
implementation example, using the PTP architecture, of
the communication procedure that allows the PD printer
1000 to notify the DSC 3012 of error status and the
15 like in the CDPS according to this embodiment.

The PD printer 1000 notifies the DSC 3012 of the
presence of object information (error information) to
be sent to it using SendObjectInfo (1930). Upon
reception of an affirmative response (OK) from the DSC
20 3012, the PD printer 1000 transmits status information
of an error or the like using SendObject and ObjectData
(1931).

<CDPS_Job (standard)>

Fig. 27 is a chart for explaining an
25 implementation example, using the PTP architecture, of
the communication procedure that allows the DSC 3012
(operation controller) to notify the PD printer 1000 of

the start of a print job in the CDPS according to this embodiment.

The DSC 3012 sends RequestObjectTransfer to the PD printer 1000 to notify it that the DSC 3012 is to

5   issue an instruction (2200). When the PD printer 1000 issues GetObjectInfo in response to this command (2201), the DSC 3012 transmits information associated with object information to be transmitted. When the PD printer 1000 requests object information (GetObject:

10   2203) in response to this information, the DSC 3012 transmits Object.Dataset (print instruction) (2204), thus issuing a print command from the DSC 3012 to the PD printer 1000.

<CDPS_JobAbort (standard)>

15   Fig. 28 is a chart for explaining an implementation example, using the PTP architecture, of the communication procedure that allows the DSC 3012 (operation controller) to issue a print abort command (CDPS_JobAbort) to the PD printer 1000 (print

20   controller) in the CDPS according to this embodiment.

<CDPS_JobContinue (standard)>

      Fig. 29 is a chart for explaining an implementation example, using the PTP architecture, of the communication procedure that allows the DSC 3012

25   (operation controller) to issue a print restart command (CDPS_JobContinue) to the PD printer 1000 (print controller) in the CDPS according to this embodiment.

In Figs. 28 and 29, after the same procedure as
in Fig. 27 is executed, the DSC 3012 issues Object
Dataset (print abort instruction) to the PD printer
1000 (2301 in Fig. 28), and issues Object Dataset

5 (print continue instruction) to the PD printer 1000
(2401 in Fig. 29).

<CDPS_PartialJobData (option)>

Fig. 30 is a chart for explaining an
implementation example, using the PTP architecture, of

10 the partial image acquisition communication procedure
(option) when the PD printer 1000 (print controller)
acquires image data (JPEG image) held by the DSC 3012
(storage) in the CDPS according to this embodiment.

When the PD printer 1000 requests the DSC 3012 of

15 information associated with an object held by the DSC
3012 (2420), the DSC 3012 sends information associated
with that object (Object Dataset) to the PD printer
1000 (2421). The PD printer 1000 then issues an
acquisition request (GetObject) by designating that

20 object (2422). Since this partial image acquisition
function designates the number of bytes from the head
of desired image data (offset) and the number of bytes
of image data to be acquired (size), as described above,
the DSC 3012 transmits partial image data of that

25 requested image file (Object Dataset) to the PD printer
1000 (2423). In this way, the PD printer 1000 can
acquire desired partial image data from the DSC 3012.

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Note that the return values in this case are
"Data_Size" and "Image_Data".

Fig. 31 is a flow chart showing the process in
the DSC 3012 or storage upon reception of the partial
5   image acquisition function that allows the PD printer
1000 (print controller) to acquire image data (JPEG
image) held by the DSC 3012 (storage) in the CDPS
according to this embodiment.

In step S21, the handle name of an image file
10   contained in <image (#PCDATA)> is acquired. The flow
advances to step S22 to acquire the number of bytes of
an offset from the head from "offset". In step S23,
the number of bytes of image data to be acquired is
acquired from "size". The flow then advances to step
15   S24 to read out image data with the designated number
of bytes from the designated offset position of the
image file in the storage device 811. The flow
advances to step S25 to output the readout partial
image data to the PD printer 1000 or print controller
20   as the request source.

In the above description, the PTP architecture is
used on USB of the physical layer. Examples using
other architectures will be explained below.
[MSC Architecture]
25   An example using MSC (Mass Storage Class) will be
described below. In this example, the leftmost
interfaces in Fig. 7 are used. In this case, the UI of

the PD printer 1000 is used in place of the UI of the

DSC 3012. Hence, all of the aforementioned operation

controller 801, storage controller 802, and print

controller 803 are assigned to the PD printer 1000.

5   Basically, using the file system of the PD printer 1000,

the aforementioned commands GetJobData,

GetPartialJobData, and GetDataList (by the file system)

are executed using Open, Read, Close of an image file,

directory manipulations (file manipulations), and the

10 like.

<CDPS_ServiceDiscovery (standard/extended)>

In this case, the PD printer 1000 transmits

CDPS_ServiceDiscovery to the DSC 3012. Even when the

DSC 3012 has no CDPS initialize function mentioned

15 above, if no response to this command returns, the PD

printer 1000 automatically determines that reception is

established in "standard" and starts MSC "bulk only".

Then, the PD printer 1000 determines that it manages

the operation controller 801, storage controller 802,

20 and print controller 803, and sets CDPS_GetPartialData

to "supported".

<CDPS_JobData (standard)>

The PD printer 1000 acquires image data

designated by a print command. In this case, the PD

25 printer 1000 issues "Receive Command" to the DSC 3012,

which transmits image data "Image Data" to the PD

printer 1000 in response to that command. In practice,

image data in the storage device 811 is acquired using
a SCSI command via the file system built on the PD
printer 1000. Note that the return values at this time
are "Data_Size" and "Image_Data".

5   <CDPS_PartialJobData (option)>

This procedure is basically the same as
"CDPS_JobData" mentioned above, except that partial
image data is to be acquired. Note that the return
values in this case are also "Data_Size" and

10   "Image_Data".

[Bluetooth Architecture]

An example using Bluetooth will be explained
below. The rightmost interfaces in Fig. 7 are used.
In this embodiment, agreements of upper application

15   layers are described using Bluetooth Still Image
Profile that can establish a session between two
devices as upper communication layers of the physical
layers so as to exchange objects.

In case of this Bluetooth Still Image Profile,

20   another connection in the direction of DSC (Host) → PD
printer (Slave) is formed in addition to the
aforementioned connection, and information is
transmitted by issuing a normal "PutImage" command from
the DSC.

25   For the sake of simplicity, assume that
connection 1: PD printer (host) → DSC (slave)
connection 2: PD printer (slave) → DSC (host)

The protocols of respective service functions in Bluetooth will be explained below. Since the service functions shown in Figs. 32 to 43 correspond to those shown in Figs. 19 to 30 above, they will be briefly

5 explained.

<CDPS_ServiceDiscovery (standard/extended)>

Fig. 32 shows the protocol of the transition procedure to the CDPS in Bluetooth. As in Fig. 19, connection partners are recognized by keywords (Marco,

10 Polo). The DSC 3012 notifies the support level of its UI in addition to this keyword (3200). Based on this support level, the PD printer 1000 notifies the DSC 3012 of the UI to be used of one of the DSC and PD printer 1000 by appending this information to a keyword

15 (3201).

<CDPS_ServiceDiscovery (standard/extended)>

Fig. 33 shows the subsequent part of the protocol of the transition procedure to the CDPS in Bluetooth, and a communication in the CDPS mode is established

20 between the DSC 3012 and PD printer 1000. With this protocol, the PD printer notifies the DSC 3012 of the procedures ("standard", "extended") that the printer supports (3202), and the DSC 3012 notifies the PD printer 1000 of the procedure (e.g., "standard" that

25 the DSC supports (3203).

<CDPS_Service (standard)>

Fig. 34 is a chart for explaining the protocol of

the notification procedure of the functions of the PD

printer 1000 in Bluetooth. With this protocol, the PD

printer 1000 notifies the DSC 3012 of the functions of

5   the PD printer 1000 (3204).

<CDPS_JobData (standard)>

Fig. 35 is a chart showing the protocol that

allows the PD printer 1000 to acquire image data from

the DSC 3012 based on a print command in Bluetooth.

10   The printer 1000 requests the DSC 3012 to send image

data by specifying an image file (3205). The DSC 3012

transmits the requested image data to the printer 1000

(3206). The return values in this case are "Data Size"

and "Image Data".

15   <CDPS_PageStart (standard)>

Fig. 36 shows the protocol that allows the PD

printer 1000 to notify the DSC 3012 of print start in

Bluetooth, and print start is notified using Image

Object Data.

20   <CDPS_PageEnd (standard)>

Fig. 37 is a chart showing the protocol that

allows the PD printer 1000 to notify the DSC 3012 of

print end for one page in Bluetooth, and the printer

notifies print end using Image Object Data.

25   <CDPS_JobEnd (standard)>

Fig. 38 is a chart showing the protocol that

allows the PD printer 1000 to notify the DSC 3012 of

the end of a print job in Bluetooth, and the printer

notifies the end of a print job using Image Object Data.

<CDPS_Error (standard)>

Fig. 39 is a chart showing the protocol that

5   allows the PD printer 1000 to notify the DSC 3012 of a

printer error in Bluetooth, and the printer 1000

notifies a printer error using Image Object Data.

<CDPS_Job (standard)>

Fig. 40 is a chart showing the protocol that

10   allows the DSC 3012 to issue a print command to the PD

printer 1000 in Bluetooth. With this protocol, the DSC

3012 informs the printer 1000 that it is ready to issue

an instruction (3210). The DSC 3012 then issues a

print instruction to the printer 1000 (3211).

15   <CDPS_JobAbort (standard)>

Fig. 41 is a chart showing the protocol that

allows the DSC 3012 to issue a print abort command to

the PD printer 1000 in Bluetooth. With this protocol,

the DSC 3012 informs the printer 1000 that it is ready

20   to issue an instruction (3210). The DSC 3012 then

issues a print abort instruction to the printer 1000

(3212).

<CDPS_JobContinue (standard)>

Fig. 42 is a chart showing the protocol that

25   allows the DSC 3012 to issue a print restart command to

the PD printer 1000 in Bluetooth. With this protocol,

the DSC 3012 informs the printer 1000 that it is ready

to issue an instruction (3210). The DSC 3012 then
issues a print continue instruction to the printer 1000
(3213).

<CDPS_PartialJobData (option)>

5   Fig. 43 is a chart showing the protocol that
allows the PD printer 1000 to acquire partial image
data from the DSC 3012 based on a print command. The
return values in this case are "Data Size" and "Image
Data". The printer 1000 requests the property of an
10   image file of the i-th handle (3214), and requests a
partial image of that image file (3215). In response
to this request, the DSC 3012 transmits the requested
partial image data to the printer 1000 (3216).

Figs. 44A to 44C depict tables for explaining the
15   support levels of the DSC 3012 and PD printer 1000,
which serve as criteria upon determining how to assign
various control functions (operation controller 801,
storage controller 802, and print controller 803)
mentioned above. Fig. 44A shows the support levels of
20   the operation controller 801, Fig. 44B shows those of
the storage controller 802, and Fig. 44C shows those of
the print controller 803. Note that the DSC 3012 can
set support levels "0" to "4", and the PD printer 1000
can set support levels "1" to "3". If the DSC 3012 and
25   PD printer 1000 have the same support level, which of
functions is to be preferentially used is left to the
discretion of the decision side.

For example, in the support levels of the
operation controller 801 in Fig. 44A, level "4" claims
use of the function of the DSC 3012, and level "3"
indicates that the viewer and operation buttons are
5   equipped. Level "2" indicates that only operation
buttons are equipped, level "1" indicates that only
minimum required functions are provided, and level "0"
indicates that this function is not supported.

In the support levels of the storage controller
10   802 in Fig. 44B, level "4" claims use of the function
of the DSC 3012, and level "3" indicates that a handle
function is equipped. Level "2" indicates that an
image file system is provided, level "1" indicates that
only a function of accessing the storage device 811 is
15   supported, and level "0" indicates that this function
is not supported.

Furthermore, in the support levels of the print
controller 803 shown in Fig. 44C, level "4" claims use
of the function of the DSC 3012, and level "3"
20   indicates that a rendering function is equipped. Level
"2" indicates that only a halftoning process is
supported, level "1" indicates that only a JPEG
decoding function is supported, and level "0" indicates
that this function is not supported.

25   The functions of the PD printer 1000 and DSC 3012
presented in this way are compared, the most efficient
one of the functions is determined for each function,

and function assignments shown in Figs. 12 to 14, Fig.

17, and Fig. 18 above are implemented.

[First Embodiment]

     A print system formed by the DSC 3012 and PD

5   printer 1000 according to the first embodiment of the

present invention will be exemplified below. In the

print system according to the first embodiment, a case

will be explained below wherein the print process based

on the CDPS according to this embodiment is executed

10 using a DPOF file stored in the DSC 3012. Note that

this DPOF file may be generated using operation buttons

and the switches 3103 on the basis of the contents

displayed on the display unit 2700 of the DSC 3012, or

it may be generated based on operations at the PC 3010

15 while the PC 3010 and DSC 3012 are connected. In

either case, this DPOF file is stored in the memory

card 3019 together with image data.

     Fig. 45 shows a data example of the

aforementioned DPOF file.

20   In case of Fig. 45, images to be printed are

described in two lines indicated by:

          ../DCIM/105GANON/IMG_0572.JPG

          ../DCIM/105GANON/IMG_0573.JPG

     This means that a directory "DCIM" includes a

25 subdirectory "105GANON", and image data with a file

name "IMG_0572.JPG" or "IMG_0573.JPG" in that

subdirectory is designated as an image to be printed.

Fig. 46 is a flow chart for explaining the
process in the DSC 3012 when the DSC 3012 according to
the first embodiment issues a print instruction to the
PD printer 1000.

5   In step S400, a DPOF file is generated, as
described above. The flow advances to step S401, and
the generated DPOF file is stored in the memory card.
Note that this DPOF file is normally generated while
the DSC 3012 is offline (it is connected to neither the
10   PC nor the printer). It is checked in step S402 if the
DSC 3012 is connected to the printer. If YES in step
S402, the flow advances to step S403 to check if the
connected printer is compatible to the aforementioned
CDPS. If NO in step S403, the flow advances to step
15   S407, the DPOF file stored in the memory card 3109 is
transmitted to the printer so as to instruct it to
execute a print process based on that DPOF file.

On the other hand, if it is determined in step
S403 that the printer is compatible to the CDPS (assume
20   that the aforementioned PD printer 1000 is connected in
this case), the flow advances to step S404 to execute
the CDPS initialize process, thereby acquiring
Capability from the printer. The flow advances to step
S405 to designate a print method which is not
25   designated in the DPOF file and is to be used by the
operator with reference to the functions of the
connected PD printer 1000. This print method includes,

for example, the paper type, print quality, layout
print, and the like used in the print process. Upon
completion of the designation inputs of the print
method, if a print start instruction is issued using
5   the operation button 3103, the flow advances to step
S406 to send an image selected by the DPOF file stored
in the memory card and the contents that instruct its
print method to the PD printer 1000, thereby executing
a print process.

10.   Note that a default print condition can be set in
step S405 in addition to the functions of the printer.

         With this method, when the user takes photos
using this DSC 3012 while, e.g., traveling, he or she
sets photos to be output and their numbers of prints
15   and stores them in the memory card 3109. After
reaching home, the user can set the print method in
correspondence with the functions of the connected
printer, and can print photos.

         According to this method, since the DSC 3012 need
20   only send images designated by the DPOF file from the
stored image information, and a print method
corresponding to the connected printer to that printer,
the arrangement of the DSC 3012 can be simplified.
[Modification of First Embodiment]

25   In this embodiment, a print method setup process
can be completed by transferring only the CDPS print
designation since a DPOF file used in a print process

is designated in CDPS_job as a print designation command of the CDPS. In this way, the relationship between selection of an image and its print method can become more obvious than the above first embodiment.

5   In this case, the process of the DSC can be executed in substantially the same manner as in the flow chart shown in Fig. 46, but the process in step S406 is slightly different. That is, in step S406 CDPS commands are generated based on the print instruction

10   input in step S405, and a DPOF file to be printed is set in a handle used to designate an image.

          A practical example of such commands will be described below.

          An example of CDPS_job that prints on L-size

15   paper in a 2 × 2 layout on the basis of a DPOF file designated by handle 1 will be described below.

          In the following description, a phrase on the right side of ":" explains a command described in < >.

```
<?XML version="1.0" encoding=UTF-16"?>
```

20
```
<command(CDPS_job)>
<job>
<capability>
<papersize("L")>               : paper size (L size)
<papertype("Photo")>           : photo paper
```
25
```
<date("off")>                  : date print = OFF
<layout("2×2")>                : layout 2 × 2
</capability>
```

```
<printlist>
<image("handle1")>              : handle1 = DPOF file
</printlist>
</job>
```

In the aforementioned command sequence, <capability> designates the paper size, paper type, and date print except for layout, and the layout is generated by the DSC 3012 based on the capability of the PD printer 1000 and corresponds to a command of the CDPS. An image to be printed is designated by the DPOF file (<image("handle1")>: handle1 = DPOF file).

In this manner, the CDPS according to this embodiment can be easily associated with the DPOF file. Note that the first embodiment is premised on that the PD printer 1000 have a decoding function of this DPOF file.

A field of "DPOF file" may describe the file name of that DPOF file or directory information.

The DPOF file itself is not an image file. When a reproduction apparatus such as a printer or the like recognizes that information sent as an image file is a DPOF file, it decodes the DPOF file, and recognizes a file name as image designation information described in that file.

The printer requests the camera of a handle list, and recognizes a handle corresponding to the decoded file name.

Then, the printer requests the camera of image

data using the recognized handle name corresponding to

an image which is designated to be printed.

[Second Embodiment]

5   The second embodiment of the present invention

will be described below. In this embodiment, the DSC

3012 interprets a DPOF file, and sends a command

sequence based on the aforementioned CDPS to the PD

printer 1000.

10   The process in this case will be described below

with reference to the flow chart in Fig. 47. Note that

the same step numbers in Fig. 47 denote processes

common to those in Fig. 46, and a description thereof

will be omitted. In Fig. 47, the processes in steps

15 S400 to S405 and S407 are the same as those in Fig. 46.

If a print method which is compatible to the

connected printer 1000 is input and designated in step

S405, the flow advances to step S416, and a DPOF file

stored in the memory card 3109 is read out and

20 interpreted. Then, a CDPS job command formed by

embedding image designation information which specifies

an image selected by that DPOF file in a CDPS command

sequence is generated. The flow then advances to step

S418 to issue a print instruction to the PD printer on

25 the basis of that CDPS job command.

A practical example of such command will be

described below.

In the following description, a phrase on the right side of ":" explains a command described in < >.

An example of CDPS_job that prints images (specified by the DPOF file) designated by handle 1 on L-size paper in a 2 × 2 layout will be described below.

```
<?XML version="1.0" encoding=UTF-16"?>
<command(CDPS_job)>
<job>
<capability>
<papersize("L")>                    : paper size (L size)
<papertype("Photo")>                : photo paper
<date("off")>                       : date print = OFF
<layout("2×2")>                     : layout 2 × 2
</capability>
<printlist>
   <image("handle1")>                   : handle of the first
                          image designated in the DPOF file
<image("handle2")>                    : handle of the second
                          image designated in the DPOF file
...
   <image("handleN")>                   : handle of the N-th
                          image designated in the DPOF file
</printlist>
</job>
```

In this case, since the printer need only support CDPS commands, the arrangement of the printer can be simplified.

If the print setups described in a DPOF file are
different from those described in a CDPS script,
whether the instructions of the DPOF file or CDPS are
to be preferentially used may be designated.

5   When the DPOF file is preferentially used, a
print process that reflects the intention of the user
who took photos and designated the print method can be
realized. Conversely, when the setups based on the
CDPS are preferentially used, a print process based on

10   the functions of the printer can be realized.
[Third Embodiment]

Fig. 48 is a flow chart for explaining the
processes according to the third embodiment of the
present invention, and shows processes after step S404

15   in the flow chart of Fig. 46 above.

In this case, after the CDPS compatibility is
confirmed, and the CDPS initialize process is executed
in step S404, it is determined in step S480 which of an
instruction based on the DPOF file or the print method

20   set based on capability is used to make a print process.
The CDPS or DPOF to be used may be set as a default, or
may be designated on a menu window or the like of the
display unit 2700 using the operation button 3103.

On the other hand, DPOF is interpreted and it may

25   ·be selected at step S480, either an instruction by DPOF
or a printing method determined by CDPS based on
capability, in accordance with the contents of the DPOF.

In this case, if the number of images to be
printed according to DPOF is larger than a
predetermined number, then the process may advance to
step S482, or if the number of images to be printed

5   according to DPOF is less than the predetermined number,
then the process may advance to step S481. This is
effective in a case where the number of images to be
printed at once is limited in CDPS.

Further, if DPOF includes print conditions which

10 do not satisfy with the capacity of the printer
described in the capability, then the process may
advance to step S481, or if not, the process may
advance to step S482. This is effective in a case
where a conversion process is performed so as to match

15 DPOF with CDPS.

When the print process is implemented using the
CDPS, the flow advances to step S482, and data required
to designate a print method by the PD printer 1000 are
input as in step S405 above. It is checked if a CDPS

20 script generated in this way is inconsistent with a
DPOF file stored in the memory card 3109. If no
inconsistency is found, the flow advances to step S484
to generate a CDPS command formed by embedding the DPOF
file in the CDPS (the aforementioned first or second

25 embodiment). In step S485, a print instruction based
on that command is issued to the printer.

On the other hand, if it is determined in step S483 that some inconsistency is found, the flow advances to step S486 to display a warning message indicating that inconsistency on the display unit 2700.

5   The control waits in step S487 until one of the contents designated by the CDPS and those designated by the DPOF file is selected. After the selection, the selected print instruction contents are set in step S488.

10   If it is determined in step S480 that the print process is to be implemented using the DPOF file, the flow advances to step S481 to send that DPOF file to the PD printer 1000, thus executing the print process.

As described above, an image against the user's

15   intention can be prevented from being printed due to inconsistency between the print setup contents in the originally stored DPOF file and those based on items input by connecting the printer.

In the above embodiment, when a print process is

20   executed based on the DPOF file, a message indicating that the print process based on the DPOF is in progress may be displayed on the display unit 2700 of the DSC 3012. Conversely, when a print process based on the print condition of only the CDPS is in progress, a

25   message indicating of executing based on the CDPS may be displayed on the display unit 2700. Also, when a print process based on the print conditions of both the

DPOF and CDPS is in progress, a message indicating of executing based on both the DPOF and CDPS may be displayed.

Such display may be switched every time one page is printed. In this way, different print conditions for respective pages (or images) can be coped with.

A display that allows the user to identify whether or not the contents of the DPOF are reflected on the print condition used in the current print process may be made on the display unit 2700.

The functional arrangements in the above embodiments will be described below with reference to Figs. 49A and 49B.

Fig. 49A shows the arrangement according to the first embodiment. The DSC 3012 stores a DPOF file 490. After the DSC 3012 in this state is connected to the PD printer 1000 and it is determined that they are CDPS compatible devices, a CDPS job command 491 is generated based on a new print method instruction input by a user in accordance with the print functions of the PD printer 1000. A print instruction in a format that combines the DPOF file 490 and CDPS job command 491 is transmitted to the PD printer 1000.

In the PD printer 1000, a CDPS interpreter 492 (which is normally equipped since the printer is CDPS compatible) and DPOF interpreter 493 interpret the

contents transmitted from the DSC 3012, and a print

process based on the interpretation results is executed.

Fig. 49B shows the arrangement according to the

second embodiment. As in Fig. 49A, the DPOF file 490

5   is stored in the DSC 3012. After the DSC 3012 in this

state is connected to the PD printer 1000 and it is

determined that they are CDPS compatible devices, a

CDPS command sequence 491 is generated based on a new

print method instruction input by the user in

10   accordance with the print functions of the PD printer

1000. Upon sending a print instruction to the PD

printer 1000, since the PD printer 1000 has no DPOF

interpreter 493, the DSC interprets the DPOF file 490

to generate a CDPS job command 491a formed by embedding

15   a handle that indicates an image designated by the DPOF

file 490 in the CDPS command sequence, and sends that

CDPS job command 491a to the PD printer 1000.

The PD printer 1000 does not comprise any DPOF

interpreter 493, and the CDPS interpreter 492 (which is

20   normally equipped since the printer is CDPS compatible)

interprets the contents sent from the DSC 3012, thus

executing the print process based on the interpretation

result.

Fig. 50 is a flow chart for explaining the print

25   process in the PD printer 1000 of the first and second

embodiments described above. Note that an initial

communication establishment process upon connection of the DSC has already been done.

In step S511, a DPOF file, a CDPS script containing DPOF, or a CDPS script is acquired from the
5   connected DSC 3012. The flow advances to step S512 to interpret the file or script acquired in step S511, thus acquiring print conditions and the handle of an image to be printed. In step S513, data (image data) indicated by that handle is requested (this process can
10   be implemented by a GetObject command). Image data sent in response to this request is received (step S514), and a print process is executed (step S515). The processes in step S512 and subsequent steps are repeated until it is determined that the aforementioned
15   process are complete for all the requests.

As a result of the aforementioned process, even in a situation in which the digital camera directly communicates with the printer, only images that the user wants can be printed.

20   Note that the present invention may be applied to either a system constituted by a plurality of devices (e.g., a host computer, interface device, reader, printer, and the like), or an apparatus consisting of a single equipment (e.g., a copying machine, facsimile
25   apparatus, or the like).

The objects of the present invention are also achieved by supplying a storage medium (or recording

medium), which records a program code of a software
program that can implement the functions of the
above-mentioned embodiments to the system or apparatus,
and reading out and executing the program code stored
5   in the storage medium by a computer (or a CPU or MPU)
of the system or apparatus. In this case, the program
code itself read out from the storage medium implements
the functions of the above-mentioned embodiments, and
the storage medium which stores the program code
10 constitutes the present invention. The functions of
the above-mentioned embodiments may be implemented not
only by executing the readout program code by the
computer but also by some or all of actual processing
operations executed by an operating system (OS) running
15 on the computer on the basis of an instruction of the
program code.

        Furthermore, the functions of the above-mentioned
embodiments may be implemented by some or all of actual
processing operations executed by a CPU or the like
20 arranged in a function extension card or a function
extension unit, which is inserted in or connected to
the computer, after the program code read out from the
storage medium is written in a memory of the extension
card or unit. When the present invention is applied to
25 the storage medium, that storage medium stores the
program codes corresponding to the aforementioned flow
charts.

As described above, according to this embodiment, the PD printer is set as a USB host, and the DSC is set as a slave. Prior to the print operation, functions required for a photo direct print process are allotted

5 and assigned between the PD printer and DSC to determine an optimal print mode or a desired print mode on the DSC side so as to make a print process. Upon assigning the functions, when, for example, the DSC 3012 does not support the CDPS itself, it is impossible

10 to notify the PD printer 1000 of the support levels of the functions 800 to 803 of the DSC 3012 in step S11 in Fig. 11. Even in such case, when the support levels of the functions 800 to 803 of the DSC 3012 are determined as zero, and all of these functions 800 to 803 are

15 supported by the PD printer 1000 side, a direct print process can be done even with a CDPS incompatible DSC 3012 by essentially commonly using the CDPS resources. This process for "determining the support levels as zero" may be implemented in any of the layers in Fig. 7.

20 In this manner, by commonly using the resources on the image supply side and image output side, a short developing period, low cost, a reduction of resources, high reliability, and the like can be expected upon implementing direct print processes with a compatible

25 device and incompatible device.

In this embodiment, the PD printer is set as a USB host, and the DSC is set as a slave. However, the

present invention is not limited to such specific combination, and either device may serve as a host/slave as long as function assignment as the gist of the present invention can be suitably attained.

5   Since Capability information and various instructions are exchanged using scripts, easy export to other communication protocols can be assured, thus allowing easy standardization.

       The communication procedure between devices is 10   implemented using a versatile file and format, and a communication procedure layer of the application according to this embodiment is specified in the upper layer, thus specifying the communication procedure independently of various interface specifications.

15   In the recording system of this embodiment, since many unspecified devices are connected to each other, they have various interfaces. Under the circumstance, information must be changed using a specification which is normally supported by various interfaces. Hence, 20   since function information which must be exchanged between these devices is implemented by "file transfer" or "object transfer", various interface specifications can be easily matched.

       As the image supply device, a PDA, portable phone, 25   television, video device, image storage device, and the like may be used in addition to the digital camera.

The versatile interface includes connection to the Internet or the like in addition to the aforementioned USB, IEEE1394, and the like.

The present invention is not limited to the above embodiments and various changes and modifications can be made within the spirit and scope of the present invention. Therefore, to apprise the public of the scope of the present invention, the following claims are made.